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Chlorhexidine rinsing in physically handicapped pupils in Katlehong

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SUMMARY

Poor oral hygiene and a high prevalence of marginal gingivitis are characteristic findings in handicapped persons. The present double-blind, cross-over study was to evaluate a twice daily mouth rinse of 10ml 0,2 per cent chlorhexidine on plaque and gingivitis in physically handicapped pupils aged 6 to 21 years. The plaque index (PI) and gingival index (GI) at baselines were relatively lower than in other published studies. For PI the mean score did not exceed 1,0 at any time; for GI the same was true except for tooth 16 which was 1,1. Only mild gingival inflammation was present. The chlorhexidine rinse produced 34 per cent to 54 per cent improvement in PI values and 48 per cent to 52 per cent improvement in GI values. Highly statistically significant effects were seen for treatment and time but there was no significant learning effect. Whether the children lived at home or at the study school had no significant effect. The chlorhexidine rinse may be successfully used in physically handicapped children but the low gingival inflammation in the group suggests that simple oral hygiene improvement might produce the same effect.

OPSOMMING

Swak mondhigiëne en 'n hoë voorkoms van marginale gingivitis is algemeen in gestremde persone. Die doel van die huidige ondersoek was om die effek van 'n tweemaal per dag mondspoeling met 10ml 0,2 persent chloorheksidienoplossing op plaak en gingivitis in fisiesgestremde skoolkinders tussen 6 en 21 jaar te evalueer. Op basislyne was die plaakindeks (Pi) en gingivale indeks (Gi) relatief laer as in ander gepubliseerde studies. Die gemiddelde Pi het nooit 1,0 oortref nie. Dieselfde het gegeld vir die Gi, behalwe vir tand 16 waar dit 1,1 was. Slegs geringe ontsteking was teenwoordig. Die chloorheksidien mondspoel het tussen 34 en 54 persent verbetering in Pi waardes, en 48 tot 52 persent Gi waardes, teweeggebring. Hoogs statisties-beteknisvolle resultate op behandeling is getoon maar daar was geen leereffek nie. Dit was van geen waarde of die kinders tuis of in die skool tuisgegaan het nie. Alhoewel 'n chloorheksidien spoel met suskses in gestremde kinders gebruik kan word, dui die lae graad van gingivale ontsteking in die groep daarop dat 'n eenvoudige verbetering in mondhigiëne dieselfde effel mag hê.

INTRODUCTION

The World Health Organization defines a handicapped individual as one who, over an appreciable period, is prevented by a physical or mental condition from full participation in the normal activities of his or her age group, including those of a social, recreational, educational and vocational nature (Stewart *et al.*, 1982).

Poor oral hygiene and a high prevalence of marginal gingivitis are characteristic findings in handicapped persons (Stiefel, Rolla and Truelove, 1984; Tesini, 1981; Pieper, Dirks and Kessler, 1986; Holland and O'Mullane, 1986). This is also the case in South Africa (Bamjee, 1987; Chikte *et al.*, 1991). Many handicapped persons are unable to maintain an adequate level of oral hygiene unaided and must depend on others for assistance. This task requires that helpers are suitably skilled and motivated (Stiefel *et al.*, 1984). Mechanical cleaning of teeth by helpers is often difficult, time-consuming and not always effective so chemical plaque control is an attractive alternative.

Chemical plaque control has been successful in handicapped groups. Studies of this have concentrated on mentally handicapped children. Bay and Russel (1975) used a chlorhexidine rinse and Storhaug (1977) used chlorhexidine gel in trays. Chlorhexidine delivery combinations have included a rinse, a spray and gel (Francis, Hunter and Addy 1978a, b) as well as a chlorhexidine spray or stannous fluoride spray (Chikte *et al.*, 1991). All produced reductions in plaque and gingivitis.

Physically handicapped individuals are a neglected group and no reports could be found of plaque control studies in this group in South Africa. The objective of the present study was to evaluate the effectiveness of a 0,2 per cent chlorhexidine mouth wash programme in physically handicapped children.

MATERIALS AND METHODS

Prior to starting this study, the protocol was approved by the University of the Witwatersrand's Committee for Research on Human Subjects. Informed consent was obtained from each participant and, from the school principal who is the legal guardian of each pupil.

The study was done at the Ezibeleni School for the Physically Handicapped in Katlehong, East Rand. This is one of three schools in the then, Transvaal, now Gauteng, catering for black physically handicapped children who are mentally able to cope with normal school work. Most pupils are from the East Rand but some come from as far afield as Witbank and Pietersburg. At the time of the study there were 153 pupils (86 boys, 67 girls) aged 6 to 21 years. Of these 101 (57 boys, 44 girls) lived at the school and 52 (29 boys, 23 girls) were day pupils. To be included in the study a pupil had to be able to rinse. Initially 153 pupils participated in the study, but after the outbreak of violence in the area 24 children left the school, so only 129 of them completed all stages of the investigation. The timetable for the resident pupils requires them to rise by 06:00, to wash and dress, breakfast is served at 07:00 after which rooms and pupils are inspected. School begins at 08:00, at which time the day pupils join them. Break is at 10:30 when bread and milk is served. School ends at 13:30 with lunch for all pupils, including day pupils. At 14:30 day pupils are transported home. Live-in pupils play until 17:00 and thereafter homework and study are done. At 19:00 there is supper followed by television viewing. At 20:00 the pupils prepare for bed.

Plaque and gingival status were assessed using a plane mirror and a WHO periodontal probe (Ainamo *et al.*, 1982; PCP-115B probe, Hu-Friedy, Chicago, USA). Plaque quantity was measured with the Silness and Löe (1964) plaque index (PI) and gingival bleeding was measured with the Löe and Silness (1963) gingival index (GI). For the GI index only 0 (healthy) and 2 (bleeding) scores were recorded. Scoring was done in good natural light in a classroom.

The study had a double-blind, cross-over design. The names of the 153 pupils were arranged in descending order of age by gender and in home or live-in groupings. A random allocation was made for the first treatment in each subgroup: thereafter, pupils were alternated into treatment groups. This ensured a close age spread per subgroup. Allocation was by a person not participating in the study. All treatment bottles were coded. The school physiotherapist and nursing staff ensured that each pupil received the correct rinse. Until coding was broken at the end of the study neither pupils nor investigators knew treatment allocations. Fortunately, the 24 children who left the school were evenly spread between the trial groupings.

The cross-over design ensured that all participants used both rinses. The treatment rinse was 0,2 per cent chlorhexidine gluconate (Hibident, SmithKline Beecham, Wynberg, South Africa). The control solution was water, coloured with vegetable dye containing an extract of fernugreek seeds, with no known antiplaque properties to provide a bitter taste, prepared by a pharmacist (Mr Gregor Greenfield, personal communication). The solutions were placed into plastic bottles that self-dispensed 10ml portions (Johnson & Johnson, East London, South Africa.) Each bottle was filled to 300 ml which was sufficient for a twice daily rinse for two weeks.

Each pupil was instructed to rinse for one minute, morning and evening, and not to take any liquid or solid food into the mouth for 30 minutes after each rinse. Staff supervised rinsing by the live-in pupils and day pupils were given both verbal and written instructions.

During the week preceding the commencement of the study, the baseline PI and GI of all subjects were recorded. This was followed by 2 weeks of rinsing, after which PI and GI were again measured. After an eight-week no-rinse period, baseline PI and GI were again recorded and then followed by 2 weeks of rinsing with the second solution and subsequent PI and GI readings. Final readings were scheduled after a further eight-week interval. The trial was scheduled to begin in April 1993 but was delayed to June because of violence in the area. This, combined with school holidays and pupils leaving at the end of the year, prevented the final 20 week recording from being done.

Prior to the trial beginning, the observer (AL) was trained and re-examination of 10 per cent of the recordings indicated reproducible assessments.

Data were stored and assessed in an IBM 3083 J24 computer using SAS (1989). To examine for differences in PI and GI at baselines, and between live-in and day pupils, a two sample t-test was used. Also, 3 tests were performed manually using the following table (Professor LP Fatti, personal communication) for PI and GI.

	2 weeks	12 weeks
Group A	Chlorhexidine	Control
Group B	Control	Chlorhexidine

In, Test 1, the equality of the carry-over learning effects from the first post-rinse assessment to the second post-rinse assessment was examined with a two sample t-test, using group totals for groups A and B.

In Test 2, the equality of treatment effects (assuming carry-over effects are equal) were examined with a two sample t-test for the period differences for each group (2 weeks minus 12 weeks).

In Test 3, the equality of time period effects (assuming carry-over effects are equal) were assessed using a two sample t-test. In this test for Group A, results at 12 weeks were subtracted from those at 2 weeks; for group B the reverse order was used.

The critical level of statistical significance was set at $p<0,05$.

RESULTS

Co-operation from the pupils was exceptional — 129 completed the study, their ages ranged from 6 to 21, with a mean

Table I : *Mean plaque index scores.*

		Group A*		Group B**	
	Week	mean	sd	mean	sd
baseline 1	0	0,39	0,33	0,31	0,34
after rinse 1	2	0,19	0,25	0,32	0,31
baseline 2	10	0,39	0,29	0,35	0,27
after rinse 2	12	0,46	0,30	0,23	0,27

* rinse 1 = chlorhexidine, rinse 2 - control.
** rinse 1 = control, rinse 2 = chlorhexidine.

Table II : *Two sample t-test for plaque index data. (Group A = chlorhexidine rinse first, group B = control rinse first).*

Effect	group	mean	sd	t	P
Learning	A	0,33	0,31		
	B	0,28	0,30	1,25	>0,30
treatment	A	-0,28	0,18		
	B	0,09	0,21	9,25	<0,001*
time	A	-0,28	0,18		
	B	-0,09	0,21	4,75	<0,001*

* = Statistically significant

Table III : *Mean gingival index scores.*

		Group A*		Group B**	
	Week	mean	sd	mean	sd
baseline 1	0	0,42	0,39	0,31	0,36
after rinse 1	2	0,22	0,29	0,41	0,42
baseline 2	10	0,54	0,41	0,46	0,34
after rinse 2	12	0,59	0,42	0,22	0,31

* rinse 1 = chlorhexidine, rinse 2 - control.
** rinse 2 = control, rinse 2 = chlorhexidine.

Table IV : *Two sample t-test for gingival index data. (groupA = chlorhexidine rinse first, group B = control rinse first).*

Effect	group	mean	sd	t	P
Learning	A	0,40	0,41		
	B	0,31	0,38	1,80	>0,30
treatment	A	-0,37	0,29		
	B	0,19	0,32	9,33	<0,001*
time	A	-0,37	0,29		
	B	-0,19	0,32	3,0	<0,01*

age of 12,3 years (sd 3,8). No statistically significant differences were found between the gender and age composition nor for the PI and GI results between the live-in and day pupils so pooled results are presented.

Dental caries was low in the group. The dmft ranged from 0 to 11, 81 per cent had a score of 0 and the mean was 0,7 (sd 1,9). For DMFT, the range was 0 to 10, the mean was 1,7 (sd 2,3) and 53 per cent had a DMFT score of 0.

Mean plaque index scores are listed in Table 1. The plaque scores per tooth ranged from 0 to 2,2 in the chlorhexidine rinse first group and from 0 to 3,0 in the control rinse first group. The mean PI scores were never greater than 1 in any subgroup. Baseline scores at weeks 0 and 10 did not differ significantly between any of the groups. In the chlorhexidine rinse first group, there was a 51 per cent decrease in PI at the end of 2 weeks of chlorhexidine rinses. The opposite happened after the control rinse, where a 17 per cent increase in PI was recorded. When the control rinse was used first there was a 3 per cent increase in PI after the control rinse and a 34 per cent decrease in PI following the chlorhexidine rinse. Statistical analysis (Table II) showed statistically significant effects of treatment, ie., rinse, and time but not for learning effect. This lack of significant learning effect shows that the order of rinse solutions was not important.

Mean gingival index scores are presented in Table III. These were calculated as 0 (healthy) and 2 (bleeding). A trend similar to the mean PI scores was seen. There was a greater variation in baseline GI scores than had been seen for PI scores. In the chlorhexidine rinse first group, after the chlorhexidine, GI decreased by 48 per cent but increased by 9 per cent after the control rinse in the second phase. Among the children who first rinsed with the control solution, GI increased by 32 per cent after the control rinse in contrast to a 52 per cent decrease after the chlorhexidine rinse. Statistical analysis (Table IV) showed statistically significant effects for treatment and time but not for learning effect.

DISCUSSION

The children and school staff involved in the study, found the rinse programme easy to follow. Violence in the township interfered severely with the onset of the study and lengthened the recovery period from 8 to 11 weeks because children were sent home and the assessor could not enter the township. Assessment at the end of the final recovery period was not possible because this fell due during the Christmas vacation. Examination in the new year was not feasible because pupils had left the school and those that remained would have had a 15 week recovery period, instead of the 11 week period of the original design. In spite of this, analysis was possible immediately before and after the rinses.

There was a relatively low mean plaque index and gingival index in the study group, much lower than in mentally handicapped children in South Africa (Bamjee 1987; Chikte *et al.*, 1991), and elsewhere (Storhaug, 1977; Francis *et al.*, 1987a, b; Kalaga, Addy and Hunter, 1989). The difference between the two populations is that this physically handicapped group was of normal intelligence and capable of rinsing. A secondary aim of the study was to classify the physical handicaps and to observe the effects of these within the rinsing programme. However, this proved impossible. Handicaps were too varied, ranging from missing limbs to cerebral palsy even though all participants were capable of rinsing.

The study showed that a twice daily 0,2 per cent chlorhexidine rinse produced statistically significant reductions in plaque and gingival bleeding of proportions similar to those obtained in mentally handicapped children (Storhaug, 1977; Francis *et al.*, 1987a, b; Kalaga, 1989; Chikte *et al.*, 1991). However, the low plaque and gingival index scores at the baselines suggest that conventional oral hygiene would obtain similar effects. Rinsing would be useful when physical cleaning is difficult for an individual.

We were surprised to find no significant differences in plaque and gingival index scores between live-in and day pupils. We had thought that the socio-economic realities of life at home in the townships would have had a detrimental effect.

The low plaque and gingival scores must be a reflection on the excellent care, motivation and morale at the school.

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REFERENCES

Ainamo, J, Barnes, D, Beagrie, G, Cutress, T & Martin, J (1982) Development of the World Health Organization (WHO) Community Periodontal Index of Treatment Needs (CPITN). *International Dental Journal*, **32**, 281-291.

Bamjee, Y (1987) *Assessment of periodontal status and treatment needs of handicapped patients according to the CPITN (Community Periodontal Index of Treatment Needs) System.* MSc(Dent) research report, University of the Witwatersrand, Johannesburg pp 1-77.

Bay, LM & Russel, BG (1975) Effect of chlorhexidine on dental plaque and gingivitis in mentally retarded children. *Community Dentistry and Oral Epidemiogy*, **2**, 267-270.

Chikte, UM, Pochee, E, Rudolph, MJ & Reinach, SG (1991) Evaluation of stannous fluoride and chlorhexidine sprays on plaque and gingivitis in handicapped children. *Journal of Clinical Periodontology*, **18**, 281-286.

Francis, J, Hunter, B & Addy, M (1987a) A comparison of three delivery methods of chlorhexidine in handicapped children. I. Effects on plaque, gingivitis and tooth staining. *Journal of Periodontology*, **58**, 451-455.

Francis, J, Hunter, B & Addy, M (1987b) A comparison of three delivery methods of chlorhexidine in handicapped children. II. Parent and houseparent preferences. *Journal of Periodontology*, **58**, 458-459.

Holland, TJ & O'Mullane, D (1986) Dental treatment needs in three institutions for the handicapped. *Community Dentistry and Oral Epidemiology*, **14**, 73-75.

Kalaga, A, Addy, M & Hunter, B (1989) The use of 0.2% chlorhexidine spray as an adjunct to oral hygiene and gingival health in physically and mentally handicapped adults. *Journal of Periodontology*, **60**, 381-385.

Löe, H & Silness, J (1963) Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontologica Scandinavica*, **21**, 533-551.

Pieper, K, Dirks, B & Kessler, P (1986) Caries, oral hygiene and periodontal disease in handicapped adults. *Community Dentistry and Oral Epidemiology*, **14**, 28-30.

SAS Institute Inc. (1989) SAS/STAT Vol 1, version 6, pp 849-890 Cary NC : SAS Institute.

Stewart, RE (1982) *Pediatric dentistry - scientific foundations and clinical practice.* St Louis : CV Mosby Co.

Stiefel, DJ, Rolla, R & Truelove, EL (1984) Effectiveness of various preventive methodologies for use with disabled patients. *Clinical Preventive Dentistry*, **6**, 17-22.

Storhaug, K, (1977) Hibitane in oral disease in handicapped patients. *Journal of Clinical Periodontology*, **4**, 102-107.

Tesini, DA (1981) An annotated review of the literature of dental caries and periodontal disease in retarded individuals. *Special Care Dentistry*, **1**, 75-87.

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